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BIOLOGICAL EVALUATION OF THE GYPSY MOTH INFESTATION IN MATHEWS ARM CAMPGROUND OF THE SHENANDOAH NATIONAL PARK, VIRGINIA

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ABSTRACT

The results of egg mass surveys conducted during the week of September 11, 1984 in and around Mathews Arm Campground indicate that gypsy moth (Lymantria dispar L.) populations have increased in localized areas during the past year. Expansion of survey data to an egg mass per acre basis suggests that moderate to heavy defoliation of preferred hosts in portions of the campground could occur in 1985.

INTRODUCTION

During January and February 1984, the results of egg mass surveys conducted on the Shenandoah National Park including Mathews Arm Campground indicated that a low level gypsy moth population was established on the northern section of the park (Carothers, 1984). The majority of egg masses located during these surveys were in the campground. Projected populations for the spring and summer of 1984 were below rule of thumb thresholds for observable defoliation.

As a result, National Park Service personnel initiated mechanical methods of reducing gypsy moth populations in the campground. Egg masses were removed and destroyed prior to egg hatch during the spring of 1984 to reduce larval populations. Later, pupae were collected and destroyed to reduce adult populations. Prior to mating and egg deposition this fall, milk carton style traps were placed in the campground in densities of 3-8 traps per acre. This technique was implemented as a trap out and a confusion strategy to reduce overwintering egg and resulting larval populations next spring.

During the week of September 17, 1984, personnel from USDA Forest Service, the Animal Plant Health Inspection Service and the National Park Service conducted egg mass surveys in and around Mathews Arm Campground.

METHODS

One-fortieth acre plots, 18.6 feet in radius, were established on a grid pattern in and around the campground. The distance between plot centers was 300 feet. In addition, sample plots were also placed at 220 yard intervals on the Traces Trail which encircles the campground.

After establishing the center and edges of the plot, the crew members familiarized themselves with the difference in appearance and texture of any old and new egg masses in the plot. One member of the crew then scanned the

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stems and lateral branches of all overstory trees within the plot. Two sides of small trees and three sides of large trees were viewed with the aid of binoculars. The number of new egg masses observed on each tree was recorded. Understory trees and vegetation were also scanned. The number of egg masses occurring on all understory trees and vegetation in the plot was recorded. Objects on the ground (logs, branches, rocks, etc.) and leaf litter were examined, overturned, and examined again for the presence of new egg masses. The number of new egg masses observed on all ground objects and leaf litter was recorded.

Totals for each plot were calculated by adding the numbers of new egg masses from the three categories; overstory, understory, ground objects and leaf litter. An estimated number of new egg masses per acre was calculated by multiplying the totals for each 1/40 acre plot by a factor of 40. At the same time the plot data was being collected, subjective observations of the visibility of egg masses, size of egg masses, and signs of parasitism or predation were made.

A total of 64 plots were sampled. Fifteen of these were along the Traces Trail. The remainder were in or around the campground (Figure 1). Approximately 82 acres were surveyed during this evaluation.

RESULTS

At least one new egg mass was observed in 33 of the 64 sample plots In these positive plots, the numbers of egg masses observed ranged from 1 to 93 and the average was 10.4 (Table 1). The distribution of egg masses was found to be uneven throughout the sampled area. Concentrations of egg masses were found in the northern and western portions of the campground (Figure 2).

The vast majority of new egg masses were large in size. During the survey, no evidence of parasitism or predation of egg masses was seen.

Light defoliation (estimated at less than 5 percent) was observed during this survey. However, all of this cannot be attributed to gypsy moth feeding activity. Fall webworms (Hyphantria cunea), walkingsticks (Diapheromera femorata) and tussock moths (Hemerocampa leucostigma, and Halisidota spp.) were also observed within the survey area.

DISCUSSION

The gypsy moth population in and around the campground has increased during the 1984 season. Before egg hatch in 1984, gypsy moth populations were estimated at 99 egg masses per acre. At present, the population is estimated at 215 egg masses per acre. Again it should be pointed out that the population is not evenly distributed and that no egg masses were observed in 31 of the sample plots.

Projecting the survey data to expected defoliation involves the use of thresholds for egg mass densities and subjective observations of the relative size of egg masses. When egg mass densities on a per acre basis are estimated at 500 or above heavy defoliation (>60 percent observable from the air) is likely. At densities of between 250 and 500, light to moderate

defoliation (30-60 percent observable from the air) can be expected. These thresholds are applicable when the gypsy moth population is stable or declining and the egg masses are moderate in size. In rapidly expanding populations when the egg masses are large, the threshold levels resulting in observable defoliation are reduced. When projected egg mass densities are greater than 300 per acre, heavy defoliation is likely. Light to moderate defoliation can be expected when the densities range from 150 to 300 per acre.

Expansion of the survey data and consideration of the relative size of the egg masses indicate that moderate to heavy defoliation of individual or small groups of trees is likely during the spring of 1985. Because of the uneven distribution of egg masses in and around the campground it is very difficult to predict where areas of defoliation will occur. Figure 3 represents a "best guess" delineation of areas where moderate to heavy defoliation is likely.

The impacts of gypsy moth feeding on vegetation in portions of the survey area during 1985 will be greater than what occurred during 1984. The trees are already under stress because of the site and the activities that occur around them. Moderate or heavy defoliation of stressed trees is likely to result in increased rates of mortality, growth loss and dieback. It is doubtful that these impacts will be widespread or significantly affect the vegetation in the campground.

Impacts on visitors and visitor use are also likely to be greater in 1985 than in 1984. In the areas where moderate or heavy defoliation is likely, larval feeding and migrating may become a nuisance to visitors. Heavy defoliation of trees in individual campsites may make the sites undesirable for use by visitors because of increased temperatures, lack of shade, and decreased aesthetic value.

In order to meet the resource management objectives of the campground for 1985, it may be necessary to implement some form of suppression strategy. While the mechanical methods implemented before egg hatch in 1984 had some negative effects on the gypsy moth population in the campground, it is doubtful that similar methods, if implemented, would reduce either the degree or amount of defoliation expected during 1985.

The following scenarios are based on the data collected during this evaluation and the assumption that conditions favorable to gypsy moth growth and development will occur next spring. Factors that affect gypsy moth populations unfavorably such as cold, wet weather or high rates of parasitism or predation are not considered. These scenarios are presented only as an aid in deciding if suppression strategies should be initiated and may or may not represent what would actually happen.

Suppression Strategy	Results
1) none	Moderate to heavy defoliation in portions of the campground. Increased mortality, growth loss and dieback of affected trees. Further expansion of the gypsy moth population throughout the campground. Larvae

Suppression Strategy	Results
	will become a nuisance problem to visitors. Some campsites may become unsuitable for use by visitors.
2) mechanical methods (egg mass scraping, larval banding)	Moderate to heavy defoliation in portions of the campground. Increased mortality, growth loss and dieback of affected trees. Further expansion of the gypsy moth population throughout the campground. Larvae will become a nuisance problem to visitors. Some campsites may become unsuitable for use by visitors. The population has reached a level that mechanical methods will be ineffective in areas where defoliation is likely.
3) application (single or multiple) of a biological insecticide	Foliage protection, decrease in gypsy moth related tree mortality, growth loss and dieback. Elimination of larval nuisance and associated impacts on visitors.
4) application of a chemical insecticide	Foliage protection, decrease in gypsy moth related tree mortality, growth loss and dieback. Elimination of larval nuisance and associated impacts on visitors. Reduction in resulting gypsy moth population throughout the treated area for the following year.

ACKNOWLEDGEMENTS

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REFERENCES CITED

Carothers, W. A., 1984. Biological Evaluation of the Gypsy Moth Infestation on the Northern Section of Shenandoah National Park, Virginia. USDA Forest Service, Forest Pest Management Field Office Report #84-3-2, March 1984.

TABLE 1.--Results of 1/40 Acre Plot Sampling in and Around Mathews Arm Campground

# Egg Masses Observed	# Plots with Same Results
0	31
1	6
2	7
3	5
4	3
5	2
6	1
7	1
8	1
9	1
15	1
31	1
34	1
36	1
48	1
93	1

TABLE 2.--Expansion of Survey Data to a Per Acre Basis

# Egg Masses Observed	# Plots with Same Results	Estimated Number of Egg Masses/Acre Y=40(X)
0	31	0
1	6	40
2	7	80
3	5	120
4	3	160
5	2	200
6	1	240
7	1	280
8	1	320
9	1	360
15	1	600
31	1	1240
34	1	1360
36	1	1440
48	1	1920
93	1	3720

FIGURE 1.-- Location of sample plots in and around Mathews Arm Campground

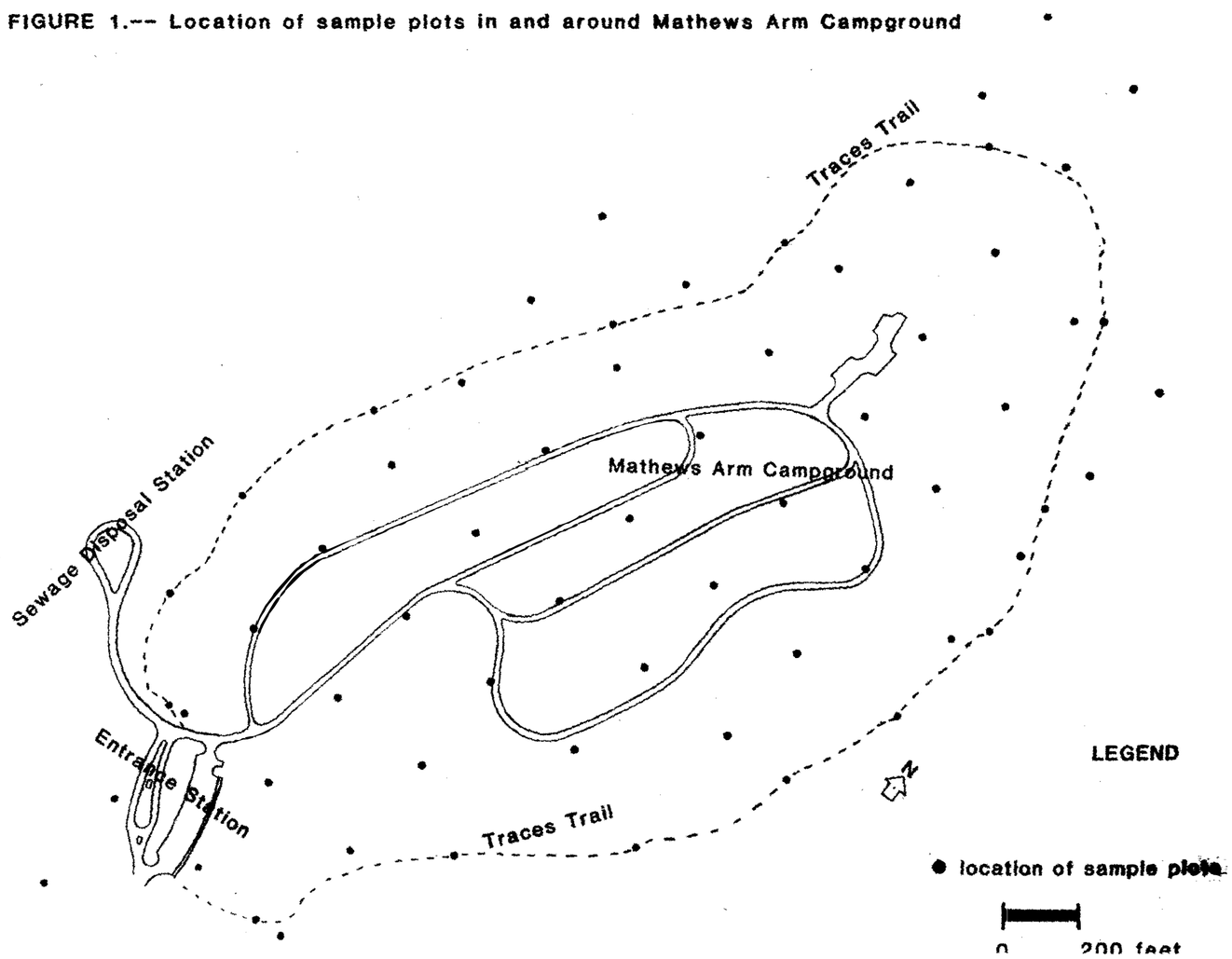

FIGURE 2.-- The number of new egg masses observed in the sample plots

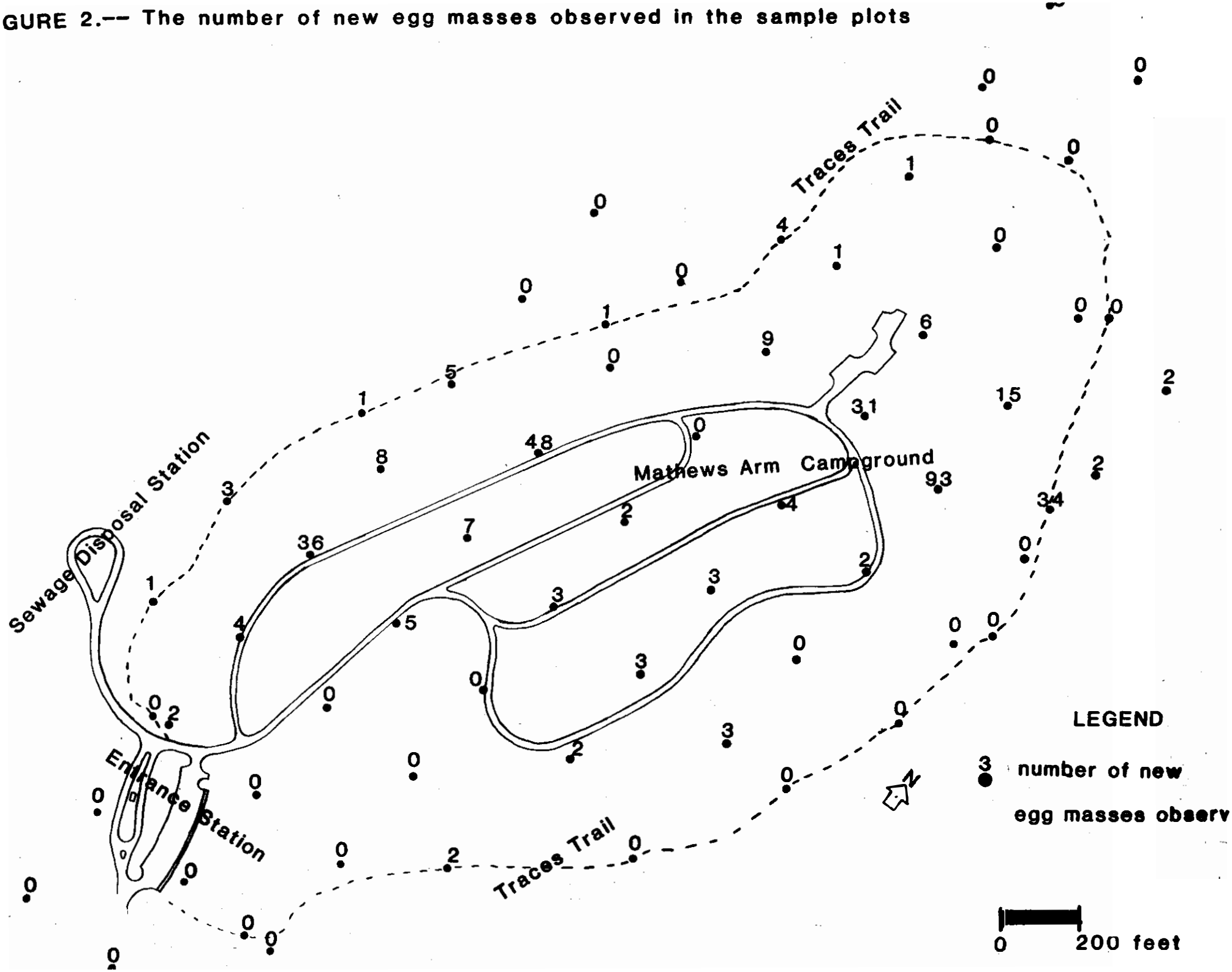

FIGURE 3.-- Areas where moderate to heavy defoliation is expected to occur during the spring of 1985